

Treatment of cancer with chemotherapeutic drugs (chemotherapy) usually induces hair loss in patients, causing emotional distress and adding an often severe psychological problem to the physiological difficulty. A method of combating alopecia, as hair loss is called in medical parlance, is scalp cooling. It has been found that lowering the scalp temperature reduces the amount of drug absorbed by hair follicles and prevents hair loss in many patients, yet does not weaken the drug's anti-cancer effect.

A new scalp cooling system based on NASA space suit technology was introduced last year. Known as the CHEMO-COOLER™ Treatment Support System, it is produced by Composite Consultation Concepts, Inc. (CCC), Houston, Texas.

The accompanying photo illustrates the use of the CHEMO-COOLER during intravenous administration of chemotherapy. Under the patient's blue head covering is a network of flexible plastic tubing through which a coolant—usually cold water—is pump-circulated from the reservoir (white cylinder). A thermistor, placed directly on the scalp, senses the surface temperature of the scalp and reports

to the controller (black box in right foreground). The controller regulates the cooling temperature within preset limits and provides a digital readout of scalp temperature and elapsed treatment time. The scalp is cooled before, during and after drug administration, the cooling time determined by the type of drug, dosage and other factors.

A study of cancer patients given drugs known to cause alopecia anticipated that none would retain as much as 25 percent of his hair; with the CHEMO-COOLER, 63 percent lost virtually no hair and nine percent suffered only moderate hair loss.

The basic technology involved in the CHEMO-COOLER stems from Johnson Space Center (JSC) development of a liquid cooling undergarment, worn beneath a space suit, through which coolant is circulated to remove the excess body heat of astronauts. In a 1970s community service project, JSC used that technology to develop an experimental scalp cooling system for a cancer patient. The system worked well on the single patient, but the



technology lay dormant for several years thereafter—until Virginia Hughes, a JSC employee, contracted lymphoma, a form of cancer for which chemotherapy was prescribed. Her husband—H. Merv Hughes II, a senior management analyst with JSC—requested permission to use the scalp-cooling prototype in an attempt to spare his wife the emotional anguish associated with hair loss. For the second time the prototype worked well; Mrs. Hughes still has a full head of hair.

While going through the daily chemotherapy treatments, Merv and Virginia Hughes decided to make

the technology available to others by commercializing the system. After retiring from NASA, Hughes formed CCC to refine and improve the scalp-cooling system and to develop other spinoff products for commercialization. CCC's CHEMO-COOLER bears little resemblance to the JSC prototype; the company spent 3-4 years in development and test before bringing it to the commercial market in 1985. ▲

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